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Title: SHIELDS project: Space Hazards Induced near Earth by Large, Dynamic Storms IC report

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SHIELDS project: Space Hazards Induced near Earth by Large, Dynamic Storms

IC report

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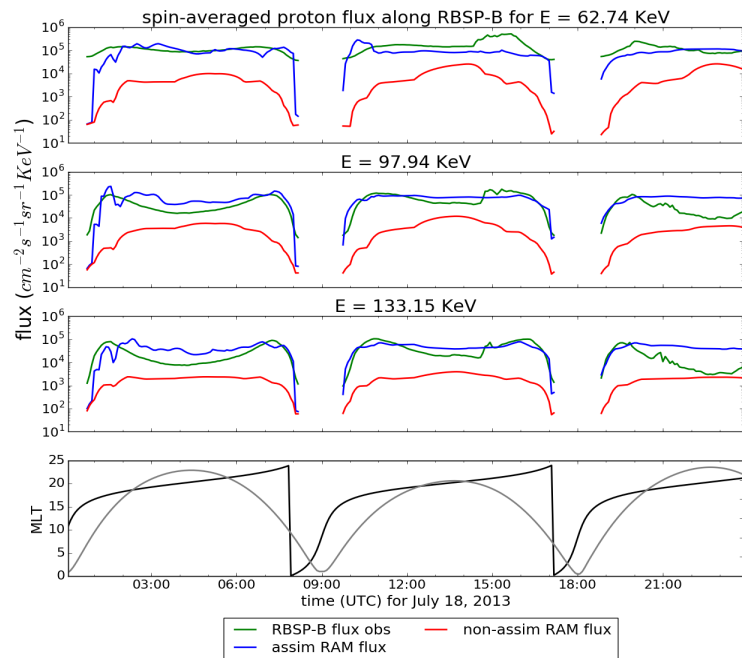
Space Hazards Induced near Earth by Large, Dynamic Storms

- The main objective of SHIELDS project is to develop a new capability to understand, model, and predict the spacecraft Surface Charging Environment (SCE).
- Institutional Computing resources have been used to:
 - Simulate substorm injections using data assimilation in kinetic ring current–atmosphere interaction model (RAM) and a 3-D equilibrium magnetic field code (SCB)
 - Simulate a high-fidelity simulation of an BATS-R-US magneto hydro-dynamic code coupled with RAM-SCB for particle tracing studies



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Experiments Results



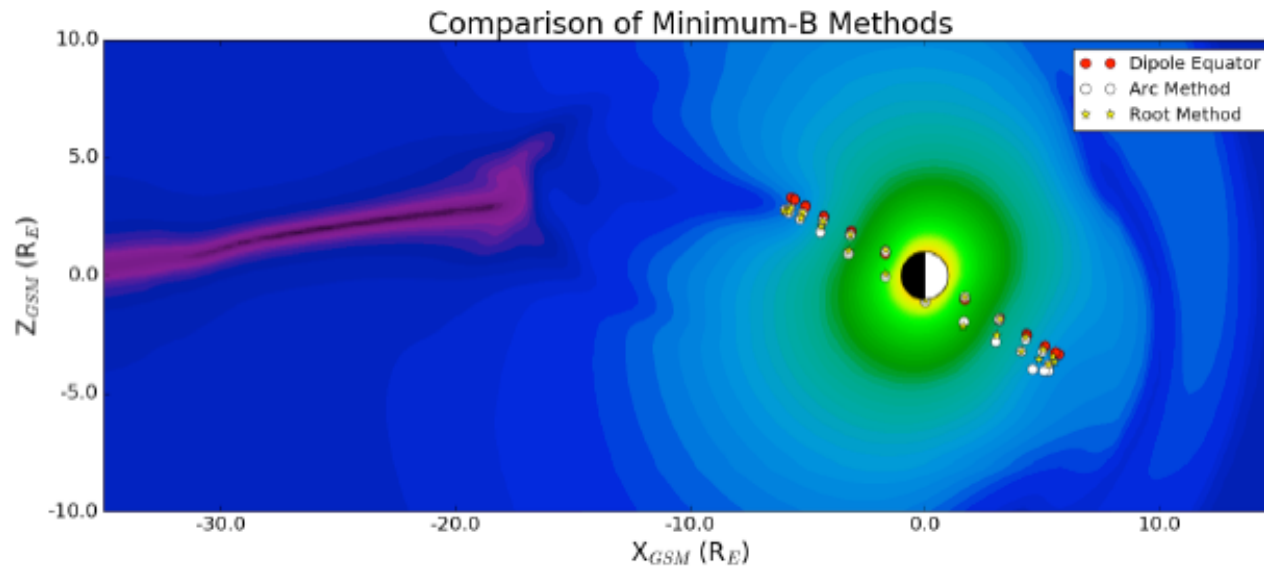
Data Assimilation

- Develop and implement SVD-based Kalman filter (30 ensemble members simulated in parallel)
- Proton flux data from the RBSP-B satellite is used for assimilation, validation with RBSP-B
- Substorm event observed on July 18, 2013; try to reproduce event with data assimilation in RAM-SCB
- Dramatic error reduction in assimilated compared non-assimilated (up to 90%)

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Experiments (Cont.)



- SHIELDS Particle Tracing Model (PTM) is a particle tracing code that computes electron and ion particle trajectories through 3D time-dependent magnetospheric electric and magnetic fields
- Currently, the code utilizes on the order of 20000 processors running for several hours in order to simulate a few hours of real time at geosynchronous orbit.



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